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Learner's Intelligent Emotion Detection System in U-learning Environment

Hyejin Kim

Institute of School Safety Research, Sungshin Women's University, Bomun-ro 34da-gil, Seongbuk-gu, Seoul, South Korea email: hyejinaa@hanmail.net

Abstract

The u-learning systems has different application platform are becoming popular. However, because of u-learning that virtually done from real classroom, the challenge is to evaluate the real emotions of the students towards the u-learning environment, perception to peers and teacher. The e-learner's intelligent emotion detection gets the information in real time bases from the virtual class where the students are connected. The different expression of eyes, lips and face are detected real-time. Based on the detection, it is being compared to the pre-determined map of shapes and compare to the data stored in database. The proposed method stated can assist a developer to create a system that can detect the negative mood of the students in an u-learning environment. Using this metrics, the system can analyze whether the student felt bored or interested on a particular content of learning aid thereby providing a continuous feedback mechanism to instructor for enhancing the content and keeping the topics updated and interesting.

Keywords*: emotion recognition, u-learning, u-learning environment*

1. Introduction

Innovative models and methods for affective learning should not only explore the impact of personal emotions in collaborative and social learning but also investigate how group emotions develop and how that impacts learning outcomes. New approaches and tools should provide both emotion awareness at an individual/group level and feedback aimed at enhancing students' motivation, engagement, self-regulation and learning outcomes, as well as their ability to cope with issues regarding social interaction and personality, which so far have been difficult to address. To this end, emotion awareness will be the base for building an efficient emotion management model which, together with an effective time-management approach, will lead to enhanced learning performance, self-motivation, self-regulation, cognitive engagement, empathy and effective handling of relationships.

One of the key characteristics of our information economy is the requirement for lifelong learning. Industrial and occupational changes, global competition, and the explosion of information technologies have all highlighted the need for skills, knowledge, and training. Focused on attracting and retaining staff, companies have placed an emphasis on training to bolster soft and hard skills to meet new corporate challenges. In many cases, career training has been placed in the hands of employees, with the understanding that employees must be able to keep ahead of technological change and perform innovative problem solving. One way of meeting the demand for these new skills is through on-line u-learning, which also offers the potential for continuous learning. Moreover, u-learning provides answers for the rising costs of tuition, the shortage of qualified training staff, the high cost of campus maintenance, and the need to reach larger learner populations.

Rising guidelines for remove learning and instruction will impact significantly the advancement of on-line learning frameworks. Institutionalization and similarity are key

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for both u-learning merchants and end clients to have the capacity to offer or buy convenient substance and between alterable parts available. They are additionally critical where diverse u-learning frameworks must associate with each other. Capturing the student's emotion and dynamically changing the topic to elevate the student's mood is missing in an u-learning. Most of the time in this type of environment even an important lecture or course ends up with the boredom of the student. All the effort of the instructor and their instructional aides become ineffective. In order to overcome these issues, more interactive learning technologies has been introduced in past few decades but was not able to find a better way to analyze the emotions at real-time in an u-learning environment. Thus there is a necessity for a system to analyze the mood of the student in an e- learning environment. The consequence of this metric can also give clue to the instructor to make the topic interesting as per the student need. There is a question which can be raised in one's mind that this can be achieved by using the written feedback system but those feedbacks won't be real-time. Thus the objective of the system is to enhance the effectiveness in the u-learning environment with the help of student's emotion and also achieve real-time response as a feedback.

2. Background of the Study

The background of the study includes the introduction of different learning strategies and technologies such as u-learning system, u-learning technology, emotion recognition, emotion recognition and emotion recognition technology.

2.1. U-learning System

Emerging standards for distance learning and education will influence in a major way the development of on-line learning systems. Standardization and compatibility are vital for both u-learning vendors and end users to be able to sell or purchase portable content and inter-changeable components on the market. They are also very important where different u-learning systems must interact with one another.

Figure 1 shows the typical overview of u-learning system. The learner accesses the learning resources and does the activities as instructed. The Moderator acts as a teacher me evaluate and act as moderator of the learners. In the end, there is an evaluation process. Basically, this illustration contains the processes and the databases.

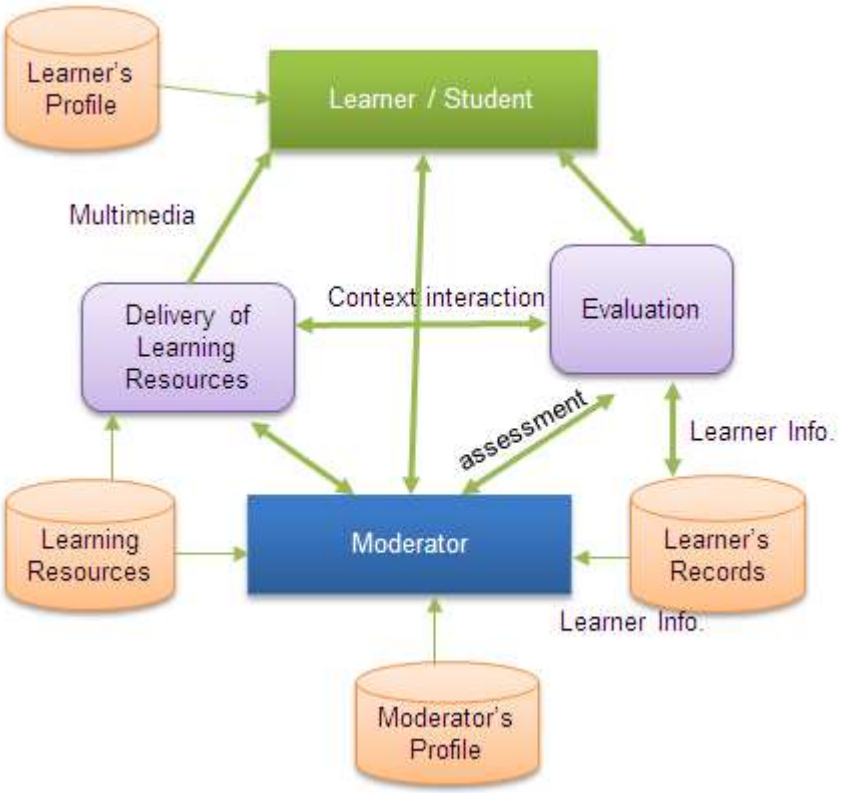

Figure 1. Overview of Typical u-learning System

One of the major benefits of using social media with students is teaching them to communicate openly, honestly, and, above all, kindly with their peers. The perceived privacy or anonymity of being online is especially freeing for boys, who may otherwise feel it is uncool to engage in class discussions or to show their emotions. Therefore, it is imperative to use this teachable moment to promote compassionate communication. New technologies can make a big difference in education. U-learning, which is the computer and network-enabled transfer of skills and knowledge, is one example of a new technology. There are studies in u-learning system that focuses on affective aspects and integrates biological sensors to measure, detect, and analyze user emotions, which are one of the most controversial topics in psychology and play a vital role in many human activities. Recent research on emotional responses to online learning has focused on the importance of learner feelings in relation to learning communities. We designed our system to complement the effectiveness of u-learning. The next generation of tools in the field will collect emotions from a variety of input channels and devices that are known to be relevant for emotion assessment, taking advantage of the latest technological advances and integration methods, including the combination of multimodal adaptive user interfaces and sensors, and from a variety of disciplines, so as to take an holistic approach to emotion recognition. Emotion detection and recognition should be applied transparently for the user, deploying both standard and new innovative devices without interrupting the learning process or disturbing the learner. Finally, the combination of several nonintrusive input channels will allow the collection of more objective and reliable emotion data than was possible using the previous methods.

The growth of Information and Communication Technology has significant effects on all people around the world. With this growth, people are able to connect with each other, especially through the Internet. These days, the Internet itself is drastically varying the provisions of services and goods, simply because of its features: immediacy, openness, ubiquity, and global reach. The approach of u-learning has become a powerful way to

deliver knowledge considering the increase in on-line users. U-learning is a new education concept by using the Internet technology, it delivers the digital content, provides a learner-orient environment for the teachers and students. U-learning can be defined as technology-based learning in which learning material is delivered electronically to remote learners via a computer network. U-learning could be seen as a professional level of education but with the advantages of lower time and cost. Some other advantages of u-learning include larger learner population, shortage of qualified training staff and lower cost of campus maintenance, up-to-date information and accessibility. In a typical u-learning environment the lecturers, students and information are in different geographical locations and are connected via the Internet. The u-learning promotes the construction of life-long learning opinions and learning society. U-learning is a broad concept and it consists with different types, namely Synchronous and Asynchronous e- Learning. Both methods have different characteristics and they use different methods to broadcast the learning materials. Asynchronous u-learning occurs when students begin and complete their training courses at different times according to their own schedule. Synchronous u-learning allows real-time interaction and raises a sense of community among learners. The security is very crucial in developing an u-learning system. Current emotion-aware systems still strive to provide a means to effectively deal with important issues in u-learning such as: students' lack of self-confidence, high dropout rates, low motivation and engagement, self-regulation and task performance. Consequently, many learning systems have been produced from current research in the areas of adaptive and personalized learning, which certainly need to consider and incorporate emotion-awareness features to enhance their ability to adapt to the real internal world of each student and to be capable of providing effective personalized feedback to a spectrum of student needs. The integration of emotion awareness can greatly advance the frontiers of educational technologies and provide an added value to enhance and improve the overall distance learning experience, as well as deliver cost-effective training programs.

2.2. U-learning Technology

Various technologies are used to facilitate u-learning. Most u-learning uses combinations of these techniques, including blogs, collaborative software, and virtual classrooms.

Audio: The radio has been around for a long time and has been used in educational purposes. Recent technologies have allowed classroom teachers to stream audio over the internet. There are also webcasts and podcasts available over the internet for students and teachers to download. For example, iTunes has various podcasts available on a variety of subjects that can be downloaded for free.

Video: Teachers can access video clips through the internet instead of relying on DVDs or VHS tapes. Videos allow teachers to reach students who are visual learners and tend to learn best by seeing the material rather than hearing or reading about it. Websites like YouTube are used by many teachers. Teachers can use messaging programs such as Skype, Adobe Connect, or webcams, to interact with guest speakers and other experts. Research on the use of video in lessons is preliminary, but early results show an increased retention and better results when video is used in a lesson. Creating a systematic video development method holds promise for creating video models that positively impact student learning.

Blogging: Blogging allows students and instructors to share their thoughts and comments on the thoughts of others which could create an interactive learning environment. Blogs allow students and teachers to post their thoughts, ideas, and comments on a website.

Computers, tablets and mobile devices: Computers and tablets allow students and teachers' access to websites and other programs, such as Microsoft Word, PowerPoint, PDF files, and images. Many mobile devices support m-learning.

Webcams: Virtual classrooms supported by such technology are becoming more and more popular, especially since they are contributing as a main solution to solving problems with travel expenses. The development of webcams and webcasting has facilitated the creation of virtual classrooms and virtual learning environments. Virtual classrooms with such technology also provide the benefits of being easy to set up.

Whiteboards: Interactive whiteboards or smartboards allow teachers and students to write on the touch screen, so learning becomes interactive and engaging.

Screencasting: Screencasting is a recent trend in u-learning. There are many screencasting tools available that allow users to share their screens directly from their browser and make the video available online so that the viewers can stream the video directly. The advantage of such tools is that it gives the presenter the ability to show his ideas and flow of thoughts rather than simply explain them, which may be more confusing when delivered via simple text instructions. With the combination of video and audio, the expert can mimic the one-on-one experience of the classroom and deliver clear, complete instructions. From the learner's point of view this provides the ability to pause and rewind and gives the learners the advantage of moving at their own pace, something a classroom cannot always offer.

Virtual Learning Environment: Virtual Learning Environments (VLE), also known as learning platforms, utilizes virtual classrooms and meetings which often use a mix of communication technologies. One example of web conferencing software that enables students and instructors to communicate with each other via webcam, microphone, and real-time chatting in a group setting, are GoToTraining, WebEx Training or Adobe Connect, which are sometimes used for meetings and presentations. Participants in a virtual classroom can raise hands, answer polls or take tests.

2.3. Emotion Recognition

Emotion recognition is the process of identifying human emotion, most typically from facial expressions. This is both something that humans do automatically but computational methodologies have also been developed.

Emotion recognition is used for a variety of reasons. Affectiva uses it to help advertisers and content creators to sell their products more effectively. Affectiva also makes a Q-sensor that gauges the emotions of autistic children. Emotient was a startup company which utilized artificial intelligence to predict "attitudes and actions based on facial expressions".Apple indicated its intention to buy Emotient in January 2016. nViso provides real-time emotion recognition for web and mobile applications through a real-time API. Visage Technologies AB offers emotion estimation as a part of their Visage SDK for marketing and scientific research and similar purposes. Eyeris is an emotion recognition company that works with embedded system manufacturers including car makers and social robotic companies on integrating its face analytics and emotion recognition software; as well as with video content creators to help them measure the perceived effectiveness of their short and long form video creative. Emotion recognition and emotion analysis are being studied by companies and universities around the world [9][10].

2.4. Emotion Recognition Technology

Emotion detection technology claims to have the intelligence to change your website, marketing and adverts dynamically, based on your audience's emotional reactions.

Technology, like our own phones, computers and even appliances, may eventually have emotional detection built into them. We will see more personalized experiences and messaging based on our facial expressions and type of engagement. For example, your refrigerator might sense that you are hungry and display a series of recipes. It sounds ridiculous now, but within the next 10 years this sort of tech could well be a reality.

There's a lot of API-accessible software online that parallels the human ability to discern emotive gestures. These algorithms driven APIs use use facial detection and semantic analysis to interpret mood from photos, videos, text, and speech [11].

Emotive analytics is an interesting blend of psychology and technology. Though arguably reductive, many facial expression detection tools lump human emotion into 7 main categories: Joy, Sadness, Anger, Fear, Surprise, Contempt, and Disgust. With facial emotion detection, algorithms detect faces within a photo or video, and sense micro expressions by analyzing the relationship between points on the face, based on curated databases compiled in academic environments. To detect emotion in the written word, sentiment analysis processing software can analyze text to conclude if a statement is generally positive or negative based on keywords and their valence index. Lastly, sonic algorithms have been produced that analyze recorded speech for both tone and word content.

Emotient. Emotient is great for an ad campaign that wants to track attention, engagement, and sentiment from viewers. The RESTful Emotient Web API can be integrated into apps, or used to help power AB testing. In addition to the API, there's a good account analytics panel. View a demo here.

Affectiva. With 3,289,274 faces analyzed to date, Affectiva is another solution for massive scale engagement detection. They offer SDKs and APIs for mobile developers, and provide nice visual analytics to track expressions over time. Visit their test demo to graph data points in response to viewing various ads.

EmoVu. EmoVu facial detection products incorporate machine learning and micro expression detection that allow an agency to "accurately measure their content's emotional engagement and effectiveness on their target audience." With a Desktop SDK, Mobile SDK, and an API for fine grained control, EmoVu offers wide platform support, including many tracking features, like head position, tilt, eye tracking, eye open/close, and more.

Nviso. Switzerland-based Nviso specializes in emotion video analytics, using 3D facial imaging tech to monitor many different facial data points to produce likelihoods for 7 main emotions. Though no free demo is offered, Nviso claims to provide a real-time imaging API.

Kairos. kairos-logoThe Emotion Analysis API by Kairos is a more SaaS-y startup in the facial detection arena. Scalable and on-demand, you send them video, and they send back coordinates that detect smiles, surprise, anger, dislike and drowsiness.

Sightcorp. Sightcorp is another facial recognition provider. Their Insight SDK offers wide platform support, and tracks hundreds of facial points, eye gaze, and has been used in creative projects, museum showcases, and at TEDX Amsterdam.

SkyBiometry. SkyBiometry-logoSkyBiometry is a cloud-based face detection and recognition tool which allows you detect emotion in photos. Upload a file, and SkyBiometry detects faces, and senses the mood between happy, sad, angry, surprised, disgusted, scared, and neutral, with a percentage rate for each point.

Face++. From their developer center, the onboarding process for Face++ looks intuitive. Face++ is more of a face recognition tool that compares faces with stored faces - perfect for name tagging photos in social networks.

Imotions. Imotions is a biometrics research platform that provides software and hardware for monitoring many types of bodily cues. Imotions syncs with Emotient's facial expression technology, and adds extra layers to detect confusion and frustration.

3. Proposed Learner's Intelligent Emotion Detection System in U-learning Environment

The e-learner's intelligent emotion detection gets the information in real time bases from the virtual class where the students are connected.

The objective of the proposed system is to detect the concentration level of the student by continuously monitoring. Once the facial features are detected then it will determine whether the student is focused on the visual content. The movement of the head will be then measured in terms of time duration and certain level of concentration will be analyzed. The two prominent measures of detecting the concentration level are eye movement and head rotation.

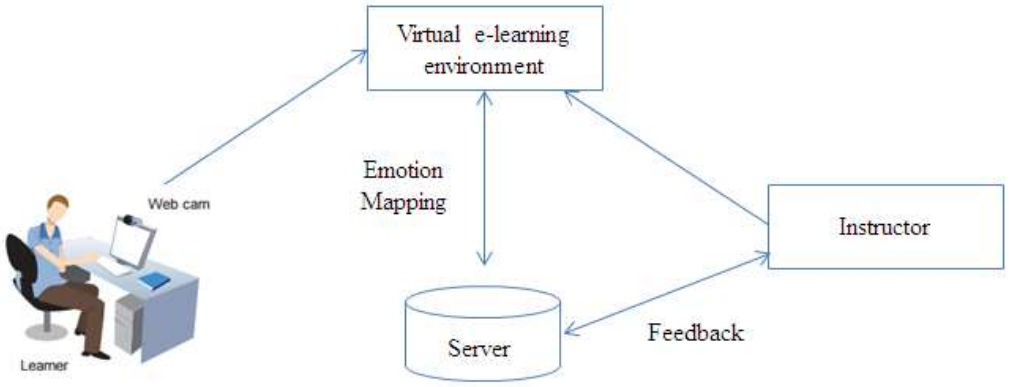

Figure 2. General Architecture

The different expression of eyes, lips and face are detected real-time. Based on the detection, it is being compared to the pre-determined map of shapes and compare to the data stored in database.

Figure 2. Flow of Proposed System

3.1. Design of the System

There are two modules in the proposed system which are eye detection module and head rotation module.

3.1.1. Eyes, Mouth and Face Detection Module

For detecting the status of the eyes, mouth and face, we need to first detect the face from the captured frame and then the eyes, mouth and face region and hence the status can be identified.

3.1.2. Emotion Mapping

Head rotation can be identified by detecting whether both the eyes are visible or not. If the eyes are not visible this means the head is turned around in the different direction. The graph will be plotted once the head movement and eyes are not detected with respect to the number of frames and the concentration level, same process applied for detecting the mouth and face.

4. Conclusion

The e-learner's intelligent emotion detection gets the information in real time bases from the virtual class where the students are connected. The different expression of eyes, lips and face are detected real-time. Based on the detection, it is being compared to the pre-determined map of shapes and compare to the data stored in database. The proposed method stated can assist a developer to create a system that can detect the negative mood of the students in an u-learning environment. Using this metrics, the system can analyze whether the student felt bored or interested on a particular content of learning aid thereby providing a continuous feedback mechanism to instructor for enhancing the content and keeping the topics updated and interesting.

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